TRANSLATION OF APPLICATION AS ORIGINALLY FILED

SUMMARY

To increase the stereophonic potential of an ordinary stereo source, a device (20) eliminates the common signals from a stereo source. The device is installed in relation to four loudspeakers, two primary (38, 40) and two secondary (42, 44), and it includes a stereo input (34, 36) and an electric circuit that links the two secondary loudspeakers. The primary loudspeakers reproduce unaltered stereo signals and the secondary loudspeakers reproduce altered signals where (by hand: when) the circuit has eliminated the common signals from the two channels of the primary stereo source. Since all "mono" components of the sound [by hand: same amplitude, same frequency] have been eliminated from the secondary outputs, we obtain a "purely stereo" source. An additional channel (45) can be added in order to reproduce the common components of the stereo source.

PATENT SPECIFICATION

TITLE: COMMON SIGNAL ELIMINATOR FROM A STEREO SOURCE

SCOPE OF INVENTION

This invention is related to the domain of sound, in particular, that which deals with the handling of various stereo source signals.

PRIOR ART

Existing devices are either "surround sound" decoders, or devices that control three channels or more wherein the rear channels are generally mono, in other words, identical. Among others, we observe the following patents:

CA 2308576 a post-amplification decoding device using a central channel. In the illustration, one of the channels feeds two rear loudspeakers that play the same signal, in other words, mono.

CA 2330960 a "surround sound" decoder using a front center and a rear center.

FR 2308267 a four channel device that isolates the determined frequency bands.

US 5497425 a system that necessarily requires an amplifier and a central channel.

US 5742691 a conversion system wherein the rear channels are mono.

US 6038324 a "surround sound" system for cars wherein the rear channels are "mono."

US 6590983 a system that uses a pair of filters to attenuate the signals at human voice level.

OBJECTIVES AND ADVANTAGES

It is a general objective of the invention to produce a three-dimensional sound effect

from any stereo sound source.

It is a particular objective to provide a device that permits, from a primary source of stereo sound, conventional or encoded, to generate a second stereophonic source different from the first, in particular by eliminating the common signals of the primary stereo sound source in order to produce a purely stereophonic sound.

A more particular objective is that the device is connected to the left and right primary signals and that this device produces two new signals; these new signals are produced by the instantaneous difference in amplitude and frequency between the left and right primary signals respectively. The result for a listener is the perception of a new stereo modulation of the primary signals thus giving the impression of a third sound dimension.

Another objective is that the difference in frequency and amplitude is channeled by polarized capacitors that let a sound pass a section at a time, having an intensity proportional to the difference of the potential between the two primary signals.

DRAWINGS

With respect to the drawings that illustrate an embodiment of the invention,

FIG. 1 is a perspective of a device in use.

FIG. 2 is a preferred circuit diagram.

FIG. 3 is a diagram of the circuit of a second embodiment of the invention.

FIG. 4 is an illustration of an example of the different signals.

DETAILED DESCRIPTION OF THE DRAWINGS

In the description that follows and in the accompanying drawings, similar numbers refer to identical parts in the figures.

FIG. 1 illustrates a device 20 that includes a box with a top side **22**

and a lateral side **24**. On the top side, one observes four electrical contacts: input of the left primary stereo signal **34**, input of the right primary stereo signal **36**, left output of modified stereo signal **30** and the right output of modified stereo signal **32**. The device is fed by a stereo signal source comprised of a left primary signal **26** and a right primary signal **28**. Each of these primary signals constitutes a potential difference between one so-called positive terminal and a so-called negative terminal; they feed the whole system. The left primary signal feeds left primary loudspeaker **38** and the left input of device **34** at the same time. The right primary signal feeds right primary loudspeaker **40** and the right input of device **36** at the same time. An internal circuit that is not shown in FIG. 1 links the inputs of the devices to the outputs. Secondary loudspeakers left **42** and right **44** are linked to output terminals left **30** and right **32**, respectively.

FIG. 2 illustrates preferred circuit **46** in a simplified form. In the preferred application, the four polarized capacitors (58, 60, 64, 66) are incorporated into the internal circuit of the box illustration in FIG. 1. Here, the negative terminals of the two primary signals are illustrated as a common negative terminal **70**. We find schematically the potential differences associated with the left and right primary stereo signals among common ground **70** and terminals left **68** and right **72** respectively. We are witnessing that primary loudspeakers left **38** and right **40** are directly affected by these left and right potential differences respectively. Moreover, positive left terminal **68** is linked directly at the same time to the positive of left secondary loudspeaker **42** and to the negative of right secondary loudspeaker **44** through a polarized capacitor **60**, and vice versa for right positive terminal **72**.

The negative terminals of the two secondary loudspeakers are also linked to ground, each through two polarized capacitors **64** and **66**.

In the preferred application of the invention, the polarized capacitors are turned in the direction as shown by the figure; however, it is important to note that the invention will work irrespective of the direction in which the capacitors are turned, for instance when common ground **70** becomes positive, barrier **66** prevents its signal from going to left loudspeaker **42** but permits the signal to pass through capacitor **64** to loudspeaker **44** while being blocked by barrier **60**. When common ground **70** is negative, terminals **72** and **68** are positive, the signal of terminal **68** is going to loudspeaker **42** and by passing capacitor **60**, it is going to loudspeaker **44**. During this time, terminal **72** which is also positive, cannot go to ground **70** because of capacitors **64** and **58**.

In action, this circuit is characterized by instantaneous local potentials **48, 50, 52, 54, 56,** each characterizing a location of the circuit. A location assigned as Left Primary Feed (abbreviated as PGA in French) **48** potential connected to loudspeaker **38**, a Right Primary Feed (abbreviated as PDA in French) **50** potential connected to right primary loudspeaker **40**, a Left Secondary Feed (abbreviated as SGA) **52** potential connected to left secondary loudspeaker **42**, a Right Secondary Feed (abbreviated as SDA) **54** potential connected to right secondary loudspeaker **44** and a primary ground **56** potential. In the embodiment of FIG. 2, the potentials are taken on the conducting materials at a representative location of the circuit, in relation to an existing potential, with conductor **52** being the continuation of conductor **48**, except for the loss through terminal **68**.

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The same is true for conductors **50** and **54**. Primary loudspeakers **38, 40** are united in a common ground **56**; secondary loudspeakers **42, 44** are united respectively on the positive side, to primary loudspeakers **38, 40** and to terminals **68, 72** that are united among themselves indirectly through blocking capacitors. For that purpose, a right left barrier **58** is positioned in parallel with right secondary loudspeaker **44** to reduce the signal to left secondary loudspeaker **42**. A left right barrier **60** is positioned in parallel with left secondary loudspeaker **42** to reduce the signal to right secondary loudspeaker **44**. After each of barriers **58** and **60**, there are two other blocking capacitors **64, 66**, this being a capacitor **64** that blocks 50% of the time the signals passing through loudspeaker **44** and which as such links 50% of the time the signals to common feed ground **70**. The same process takes place for capacitor **66**, though passing through loudspeaker **42** fed by capacitor **52**. Barriers **58** and **60** are polarized capacitors for which the direction is similar one for the other, so as to, at a given moment, let the signals pass and at a second time, block these same signals. The same is true for capacitors **64** and **66**. Polarized capacitors are used to block the primary signals at a given time. Explanation: when the signal from conduit **54** originating from a source, namely right positive feed **72**, and going to right secondary loudspeaker **44** meets the way of blocking capacitor **58**, the signal is momentarily blocked and it passes through loudspeaker element **44,** after which it finds on its way two other barriers **60, 64**. At that time, the signal is totally blocked. During this same time, the signal fed by primary left positive terminal **68** can

pass through loudspeaker **42** and pass simultaneously through capacitor **60** towards loudspeaker **44**. What passes through loudspeaker **42** is blocked by capacitor **66** but finds an open way through capacitor **58** and returns to conductor **54,** of which it reduces or increases the potential from a value of "X" volts that loudspeaker **42** will play; the same process takes place for loudspeaker **44** but while passing through capacitor **60**. As such, one achieves the elimination of the common sources and the passage of the different signals only. When the pulse or polarity changes phase, the process is reversed and negative **70** has become positive that feeds both loudspeakers **42, 44** passing through capacitors **66, 64**.

FIG. 3 illustrates an alternative embodiment of the invention. In this embodiment, an additional loudspeaker is added to the existing circuit. An additional conductor is positioned between the positive terminal of left signal **68** and the positive terminal of right signal **72**. Two capacitors **65** and **67** are installed along this additional capacitor. Between the capacitors, along the additional capacitor, another conductor links the additional conductor to ground **70**. The additional loudspeaker is positioned along this conductor with its positive terminal linked between capacitors **65** and **67**, while the negative terminal is linked to ground **70**. Capacitors **65, 67** can be turned in any direction but with the configuration illustrated, they act out of phase with the other capacitors which results in minimizing a drop in impedance of the circuit and thus avoiding the alteration of the stereophony of the primary signal. A judicious choice of the capacitance value of capacitors **65, 67** permits optimizing the system.

The advantage of adding such an additional loudspeaker is the possibility

of obtaining an additional channel appropriate for a central loudspeaker; the signal thus obtained corresponds to the common signals of the left and right primary signals, wherein the different component of the signals is eliminated. In general, such a loudspeaker is very well positioned between the two main enclosures.

FIGS. 4 to 9 show an example that illustrates what takes place to the primary signals thanks to the device. First of all, we see an example of left and right primary signals in FIGS. 4 and 5 respectively. Each signal is shown as a variation in time of the amplitude of the electrical potential between the positive and negative terminal of each signal. The potential corresponding to the common ground is represented by the horizontal line of each figure. The potential increases when the considered point moves away from this horizontal line, to give a positive potential upward and a negative downward. Here, the passing of time is represented by the progression along the horizontal line. We see that all these signals are alternating: it produces a positive time, then a negative time.

We see that FIGS. 4 and 5 are different, which may correspond, for instance, to a left signal **78** FIG. 4 and a right signal **80** FIG. 5 of a stereo source. FIG. 8 shows a superposition of the two primary signals **78, 80** of FIGS. 4 and 5 so as to be able to analyze the various components of these signals; they have common components **86** and different components **82, 84**.

FIGS. 6 and 7 represent secondary signals left **82** FIG. 6 and right **84** FIG. 7 obtained, respectively. As we had stated previously, action of the device permits the elimination of the common components of the stereo source. As such, we can see that FIGS. 6 and 7

represent the signals of FIGS. 4 and 5 respectively, wherein the components of common signal **86** FIG. 9 is subtracted or removed. Two new signals **82, 84** FIGS. 6 and 7, different from the other and the primary signals, are obtained.

FIG. 9 shows a signal that represents common component **86** to the two primary signals. This signal represents as such what must be removed from FIGS. 4 and 5 to obtain FIGS. 6 and 7 respectively. FIG. 9 shows a signal that might be reproduced by a front loudspeaker **45** and additional components to the circuit of FIG. 2. This signal can very well be used as tertiary signal for a central enclosure **45**.

DISCUSSION OF THE PREFERRED APPLICATIONS OF THE INVENTION

An objective of this invention is that the circuit includes ideally four loudspeakers, of which two the primary are in the front (FR and FL) and the two secondary which can be located either on the extreme right and left in the front, or in the rear (RR and RL). In the preferred application, the two primary loudspeakers play the unaltered stereo signals; while the two secondary loudspeakers play the new channels created by the electrical or electronic components used in the circuit. As such, the circuit is fed only by the unaltered stereo source and produces two new different channels from this one, giving a total of four different channels. The secondary loudspeakers produce a signal corresponding to the primary loudspeakers but with any common signal removed; the result for a listener is the perception of a new stereo modulation of the primary signals, thus giving the impression of an additional sound dimension. The electrical components used consist preferably of

polarized capacitors, that let pass a sound section at a time, with an intensity proportional to the potential and frequency difference between the two primary signals, taking into account the amplitude and frequency of the signals. The polarized capacitors permit the elimination of the common signals of the primary signals in the two newly produced secondary signals. For elements **58** and **60**, it is preferable to use high-value capacitors to eliminate as much as possible that which is common in both pass bands, while respecting a certain limit so as not to alter the primary signals.

The use of polarized capacitance with a very high capacitance value comes close to the extreme case where there are no capacitors at all and as such [there is] a short circuit. In contrast, the use of low capacitance capacitors comes close to the extreme case where there is no contact at all, and as such, no secondary signal. Consequently, one can easily imagine that a judicious choice of capacitors is essential for the optimal operation of the invention.

The advantages with respect to the prior art are the possibility of appreciating a new sound dimension with equipment that is inexpensive and easy to use; it can be directly installed on practically any stereo equipment. The two secondary loudspeakers can be installed at several locations which gives the system greater versatility.

It is our idea to use the difference of potential between the left and right signals as an indicator to send the signal to specific locations. We want that the left and right rear channels play when the signal is the strongest on the left or right side

respectively, so that when the secondary loudspeakers are installed in the rear of each side respectively, if a train passes from left to right, one will have the impression that this train passes from the left rear to the left front, to the right front and then to the right rear thus creating the impression of a three-dimensional sound. We have selected a rectified wave with the positive part of the wave on one side and the negative part on the other. For that, we have used polarized capacitors and connected them to reverse their directions between positive terminals **68, 72** and negative terminal **70** of the primary signals.

In current use, the device will be able to be distributed in the form of a box comprised of two pairs of connectors, namely two signal inputs and two signal outputs. Inputs **68, 72** are fed by the same source that feeds the primary loudspeakers. Each output feeds one or several secondary loudspeakers respectively. Each output can feed one or several loudspeakers connected either in series or in parallel with respect to the output.

AREAS OF USE

The invention is used in the passive mode as well as in the active mode. In the active mode, the channels are connected to the inputs of an amplifier rather than directly to loudspeakers.

Moreover, it is possible to use the invention in various applications such as: movies, shows, operas, cars, and others that use a standard or encoded stereo source.

SUMMARY:

A device that converts two left and right primary sound signals of a stereo input into four different signals; the four signals are identified as follows: one = front left **38**, two = right front

40, three = rear left **42**, four = rear right **44**; the secondary signals are used to produce one or more sounds different from the primary sounds, with the device comprised of:

- a pair of connections on the left **26** and on the right **28** of the primary loudspeakers **38, 40**, left and right,
- a pair of connections on the left **30** and on the right **32** at the secondary loudspeakers left **42** and right **44**, with right connections **28, 32** linked to a positive side and left connections **26, 30** linked to a second positive side, with left and right primary loudspeakers **38, 40** linked together to a negative side by a floating common **56**, with the secondary signals comprising barriers for the purpose of blocking respectively a part of a wave generated by the primary signals.

Signals one and two define the primary signals and signals three and four define the new and corresponding secondary signals with the new signals being non-zero when there is a positive or negative potential difference between the corresponding primary signals.

From a primary signal stereo source comprised of common parts, the device permits to generate a second stereophonic source different from the first, with the device comprising means for eliminating the common parts of the primary stereo source.

The device can function with an encoded primary sound source.

The device can be used in the passive mode, during which the primary sound signals are linked to loudspeakers. The devices can be used in the active mode during which the primary sound signals are linked to amplifiers and/or preamplifiers.

The barriers include a parallel circuit connected to a conduit **50, 54** linking **40** to **44**, the parallel circuit going to **42** and comprising in its center a DG barrier **58** and in the same way for a conduit **48, 52** comprised of a barrier **60**, with the parallel circuit including also a link to ground comprised of a barrier **66** and a barrier **64**, with barriers **58, 60** not being opposite one to the other and barriers **66** and **64** also not being opposite one to the other. Barrier **66** could be opposite to **64** to avoid having the impedance drop and permit blocking when Potential PM **56** is positive and permit passage when preferred circuit **46** is positive.

Barriers **58, 60, 66, 64** are polarized capacitors in the illustration: that has given the best results during the experiments. It is important to observe of course that other barriers can be used, such as diodes or transistors instead of capacitors, and that different and/or additional electrical and/or electronic devices can be used as an equivalent to the means and devices presently used. Consequently, it is important to understand that the means and devices used in the illustrations and the description of embodiments, represent only one of many ways to arrive at the ends expressed above consisting essentially in the creation of two additional channels having the potential of increasing stereophony by the fact that the common signals to the primary signals are eliminated. The same ends can be achieved by a different but equivalent circuit. The manner illustrated only shows one way that has proven to be simple and effective to arrive at the expected results.

It is well understood that the mode for executing this invention

described above, in reference to the attached drawings, has been given for information purposes and is not limiting in nature, and that modifications and adaptations can be made without the object deviating from the scope of this invention.

Other embodiments are possible and limited only by the scope of the claims that follow:

LEGEND	54 – SDA potential
20 – Common signal eliminator	56 – PM potential
22 – Top side	58 – Capacitor 4
24 – Lateral side	60 – Capacitor 1
26 – Left primary output	64 – Capacitor 2
28 – Right primary output	65 – Capacitor 5
30 – Left secondary output	66 – Capacitor 3
32 – Right secondary output	67 – Capacitor 6
34 – Stereo source left input	68 – Left feed +
36 – Stereo source right input	70 – Common ground
38 – Left primary loudspeaker	72 – Right feed +
40 – Right primary loudspeaker	74 – Left secondary signal
42 – Left secondary loudspeaker	76 – Right secondary signal
44 – Right secondary loudspeaker	78 – Left primary signal
45 – Tertiary loudspeaker	80 – Right primary signal
46 – Preferred circuit	82 – Left secondary signal
48 – PGA potential	84 – Right secondary signal
50 – PDA potential	86 – Tertiary signal
52 – SGA potential	